

SEQUENCE LISTING

<110> Harrington, et al.

<120> Mammalian Flap Specific-Endonuclease

<130> 9584-017

<140> 09/586,744

<141> 2000-06-02

<160> 74

<170> PatentIn version 3.0

<210> 1

<211> 380

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 1

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			20					25					30		
Ile	Asp	Ala	Ser	Met	Ser	Ile	Tyr	Gln	Phe	Leu	Ile	Ala	Val	Arg	Gln
		35						40				45			
Gly	Gly	Asp	Val	Leu	Gln	Asn	Glu	Glu	Gly	Glu	Thr	Thr	Ser	His	Leu
	50					55					60				

Met	Gly	Met	Phe	Tyr	Arg	Thr	Ile	Arg	Met	Met	Glu	Asn	Gly	Ile	Lys	65	70	75	80
Pro	Val	Tyr	Val	Phe	Asp	Gly	Lys	Pro	Pro	Gln	Leu	Lys	Ser	Gly	Glu	85	90	95	
Leu	Ala	Lys	Arg	Ser	Glu	Arg	Arg	Ala	Glu	Ala	Glu	Lys	Gln	Leu	Gln	100	105	110	
Gln	Ala	Gln	Ala	Ala	Gly	Ala	Glu	Gly	Glu	Val	Glu	Lys	Phe	Thr	Lys	115	120	125	
Arg	Leu	Val	Lys	Val	Thr	Lys	Gln	His	Asn	Asp	Glu	Cys	Lys	His	Leu	130	135	140	
Leu	Ser	Leu	Met	Gly	Ile	Pro	Tyr	Leu	Asp	Ala	Pro	Ser	Glu	Ala	Glu	145	150	155	160
Ala	Ser	Cys	Ala	Ala	Leu	Val	Lys	Ala	Gly	Lys	Val	Tyr	Ala	Ala	Ala	165	170	175	
Thr	Glu	Asp	Met	Asp	Cys	Leu	Thr	Phe	Gly	Ser	Pro	Val	Leu	Met	Arg	180	185	190	
His	Leu	Thr	Ala	Ser	Glu	Ala	Lys	Lys	Leu	Pro	Ile	Gln	Glu	Phe	His	195	200	205	
Leu	Ser	Arg	Ile	Leu	Gln	Glu	Leu	Gly	Leu	Asn	Gln	Glu	Gln	Phe	Val	210	215	220	
Asp	Leu	Cys	Ile	Leu	Leu	Gly	Ser	Asp	Tyr	Cys	Glu	Ser	Ile	Arg	Gly	225	230	235	240
Ile	Gly	Pro	Lys	Arg	Ala	Val	Asp	Leu	Ile	Gln	Lys	His	Lys	Ser	Ile	245	250	255	
Glu	Glu	Ile	Val	Arg	Arg	Leu	Asp	Pro	Asn	Lys	Tyr	Pro	Val	Pro	Glu	260	265	270	
Asn	Trp	Leu	His	Lys	Glu	Ala	His	Gln	Leu	Phe	Leu	Glu	Pro	Glu	Val	275	280	285	
Leu	Asp	Pro	Glu	Ser	Val	Glu	Leu	Lys	Trp	Ser	Glu	Pro	Asn	Glu	Glu	290	295	300	
Glu	Leu	Ile	Lys	Phe	Met	Cys	Gly	Glu	Lys	Gln	Phe	Ser	Glu	Glu	Arg	305	310	315	320
Ile	Arg	Ser	Gly	Val	Lys	Arg	Leu	Ser	Lys	Ser	Arg	Gln	Gly	Ser	Thr	325	330	335	
Gln	Gly	Arg	Leu	Asp	Asp	Phe	Phe	Lys	Val	Thr	Gly	Ser	Leu	Ser	Ser	340	345	350	
Ala	Lys	Arg	Lys	Glu	Pro	Glu	Pro	Lys	Gly	Ser	Thr	Lys	Lys	Lys	Ala	355	360	365	

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<211> 1144

<212> DNA

<213> Artificial

<220>

<223> cDNA

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cccggtgatg tctttgatgg caagccgcca cagctcaagt caggcgagct ggccaaacgc	300
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caggaggttg aaaaattcac taagcggctg gtgaaggtca ctaagcagca caatgatgag	420
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gccagctgtg ctgccttggg gaaggctggc aaagtctatg ctgcgggtac cgaggacatg	540
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aagctgccaa tccaggaatt ccacctgagc cggattctgc aggagctggg cctgaaccag	660
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<212> PRT

<213> Artificial

<220>

<223> Peptide

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Ile Asp Ala Ser Met Ser Ile Tyr Gln Phe Leu Ile Ala Val Arg Gln
35 40 45
Gly Gly Asp Val Leu Gln Asn Glu Glu Gly Glu Thr Thr Ser Leu Met
50 55 60
Gly Met Phe Tyr Arg Thr Ile Arg Met Glu Asn Gly Ile Lys Pro Val
65 70 75 80
Tyr Val Phe Asp Gly Lys Pro Pro Gln Leu Lys Ser Gly Glu Leu Ala
85 90 95
Lys Arg Ser Glu Arg Arg Ala Glu Ala Glu Lys Gln Leu Gln Gln Ala
100 105 110
Gln Glu Ala Gly Met Glu Glu Val Glu Lys Phe Thr Lys Arg Leu Val
115 120 125
Lys Val Thr Lys Gln His Asn Asp Glu Cys Lys His Leu Leu Ser Leu
130 135 140
Met Gly Ile Pro Tyr Leu Asp Ala Pro Ser Glu Ala Glu Ala Ser Cys
145 150 155 160
Ala Ala Leu Ala Lys Ala Gly Lys Val Tyr Ala Ala Ala Thr Glu Asp
165 170 175
Met Asp Cys Leu Thr Phe Gly Ser Pro Val Leu Met Arg His Leu Thr
180 185 190
Ala Ser Glu Ala Lys Lys Leu Pro Ile Gln Glu Phe His Leu Ser Arg
195 200 205
Val Leu Gln Glu Leu Gly Leu Asn Gln Glu Gln Phe Val Asp Leu Cys
210 215 220

Ile Leu Leu Gly Ser Asp Tyr Cys Glu Ser Ile Arg Gly Ile Gly Ala
225 230 235 240

Lys Arg Ala Val Asp Leu Ile Gln Lys His Lys Ser Ile Glu Glu Ile
245 250 255

Val Arg Arg Leu Asp Pro Ser Lys Tyr Pro Val Pro Glu Asn Trp Leu
260 265 270

His Lys Glu Ala Gln Gln Leu Phe Leu Glu Pro Glu Val Val Asp Pro
275 280 285

Glu Ser Val Glu Leu Lys Trp Ser Glu Pro Asn Glu Glu Glu Leu Val
290 295 300

Lys Phe Met Cys Gly Glu Lys Gln Phe Ser Glu Glu Arg Ile Arg Ser
305 310 315 320

Gly Val Lys Arg Leu Ser Lys Ser Arg Gln Gly Ser Thr Gln Gly Arg
325 330 335

Leu Asp Asp Phe Phe Lys Val Thr Gly Ser Leu Ser Ser Ala Lys Arg
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Gly Ala Gly Lys Phe Arg Arg Gly Lys
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<211> 1930

<212> DNA

<213> Artificial

<220>

<223> cDNA

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cagttcctga ttgctgttcg tcaggggtggg gatgtgctgc agaacgagga ggggtgagacc 180
accagcctga tgggcatgtt atggcaaacc atccgcatgg agaatggcat caagcctgtg 240
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gccaaagcgg	ctgtggatct	catccagaaa	cataagagca	tcgaggagat	cgtgaggcgg	780
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gaagaagagt	tgggtcaaatt	tatgtgtggt	gaaaagcagt	tttctgaaga	gcgaattcgc	960
agtgggggtca	agcggctgag	taagagccgc	cagggcagca	cccagggacg	cctcgatgat	1020
tttttcaagg	tgacaggctc	actctcctca	gctaagcgca	aggagccaga	acccaagggg	1080
cctgctaaga	agaaagcaaa	gactggggga	gcggggaagt	tccgaagggg	aaaataaacc	1140
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gttctgtgca	actgcgagca	atgtcttaag	gaagaagaag	ataaagccgg	gagcgaggct	1440
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ctgctccttc	taattttcact	gtccctgaaa	gatgcccatc	agcctgggat	tcgctgatgg	1560
aagaactgca	aagagacgca	gcagagagaa	gtctggctga	caacagattt	agtactgacc	1620
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tccagtgttg	gggattgacc	ccagggcaaa	ggcattaagt	gtgccactga	cctgtgcctc	1800
caagtgatgt	tctgacagcc	tttctgaggc	aatcaattga	attgaggttt	tgggagaaga	1860
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<212> PRT

<213> Artificial

<220>

<223> Peptide

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Ile Asp Ala Ser Met Ser Leu Tyr Gln Phe Leu Ile Ala Val Arg Gln
35 40 45

Gln Asp Gly Gly Gln Leu Thr Asn Glu Ala Gly Glu Thr Thr Ser His
50 55 60

Leu Met Gly Met Phe Tyr Arg Thr Leu Arg Met Ile Asp Asn Gly Ile
65 70 75 80

Lys Pro Cys Tyr Val Phe Asp Gly Lys Pro Pro Asp Leu Lys Ser His
85 90 95

Glu Leu Thr Lys Arg Ser Ser Arg Arg Val Glu Thr Glu Lys Lys Leu
100 105 110

Ala Glu Ala Thr Thr Glu Leu Glu Lys Met Lys Gln Glu Arg Arg Leu
115 120 125

Val Lys Val Ser Lys Glu His Asn Glu Glu Ala Gln Lys Leu Leu Gly
130 135 140

Leu Met Gly Ile Pro Tyr Ile Ile Ala Pro Thr Glu Ala Glu Ala Gln
145 150 155 160

Cys Ala Glu Leu Ala Lys Lys Gly Lys Val Tyr Ala Ala Ala Ser Glu
165 170 175

Asp Met Asp Thr Leu Cys Tyr Arg Thr Pro Phe Leu Leu Arg His Leu
180 185 190

Thr Phe Ser Glu Ala Lys Lys Glu Pro Ile His Glu Ile Asp Thr Glu
195 200 205

Leu Val Leu Arg Gly Leu Asp Leu Thr Ile Glu Gln Phe Val Asp Leu
210 215 220

Cys Ile Met Leu Gly Cys Asp Tyr Cys Glu Ser Ile Arg Gly Val Gly
225 230 235 240

Pro Val Thr Ala Leu Lys Leu Ile Lys Thr His Gly Ser Ile Glu Lys

	245		250		255
Ile Val Glu Phe Ile Glu Ser Gly Glu Ser Asn Asn Thr Lys Trp Lys					
	260		265		270
Ile Pro Glu Asp Trp Pro Tyr Lys Gln Ala Arg Met Leu Phe Leu Asp					
	275		280		285
Pro Glu Val Ile Asp Gly Asn Glu Ile Asn Leu Lys Trp Ser Pro Pro					
	290		295		300
Lys Glu Lys Glu Leu Ile Glu Tyr Leu Cys Asp Asp Lys Lys Phe Ser					
	305		310		315
Glu Glu Arg Val Lys Ser Gly Ile Ser Arg Leu Lys Lys Gly Leu Lys					
		325		330	335
Ser Gly Ile Gln Gly Arg Leu Asp Gly Phe Phe Gln Val Val Pro Lys					
	340		345		350
Thr Lys Glu Gln Leu Ala Ala Ala Ala Lys Arg Ala Gln Glu Asn Lys					
	355		360		365
Lys Leu Asn Lys Asn Lys Asn Lys Val Thr Lys Gly Arg Arg					
	370		375		380

<210> 6

<211> 1149

<212> DNA

<213> Artificial

<220>

<223> cDNA

<400> 6

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cagtttttaa ttgctgtaag acagcaagac ggtgggcagt tgaccaatga agccggtgaa	180
acaacgtcac acttgatggg tatgttttat aggacactga gaatgattga taacggtatc	240
aagccttggt atgtcttcga cggcaaacct ccagctttga aatctcatga gttgacaaag	300
cggtcttcaa gaaggggtga aacagaaaaa aaactggcag aggcaacaac agaattggaa	360
aagatgaagc aagaaagaag attggtgaag gtctcaaaag agcataatga agaagcccaa	420
aaattactag gactaatggg aatcccatat ataatagcgc caacggaagc tgagggtcaa	480
tgtgctgagt tggcaaagaa gggaaaggtg tatgccgcag caagtgaaga tatggacaca	540

ctctgttata gaacaccctt cttgttgaga catttgactt tttcagaggc caagaaggaa 600
 ccgattcacg aaatagatac tgaattagtt ttgagaggac tcgacttgac aatagagcag 660
 tttgttgatc tttgcataat gcttggttgt gactactgtg aaagcatcag aggtgttggt 720
 ccagtgcag ccttaaaatt gataaaaacg catggatcca tcgaaaaaat cgtggagttt 780
 attgaatctg gggagtcaaa caacactaaa tggaaaatcc cagaagactg gccttacaaa 840
 caagcaagaa tgctgtttct tgaccctgaa gttatagatg gtaacgaaat aaacttgaaa 900
 tggtcgccac caaaggagaa ggaacttatc gagtatttat gtgatgataa gaaattcagt 960
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 ggtaggtag atgggttctt ccaagtgggtg cctaagacaa aggaacagct ggctgctgcg 1080
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<212> PRT

<213> Artificial

<220>

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		20						25					30		
Ile	Trp	Ile	Tyr	Gln	Phe	Leu	Lys	Ala	Val	Arg	Asp	Gln	Glu	Gly	Asn
		35					40					45			
Ala	Val	Lys	Asn	Ser	His	Ile	Thr	Gly	Phe	Phe	Arg	Arg	Ile	Cys	Lys
	50					55					60				
Leu	Leu	Tyr	Phe	Gly	Ile	Arg	Pro	Val	Phe	Val	Phe	Asp	Gly	Gly	Val
65					70					75				80	
Pro	Val	Leu	Lys	Arg	Glu	Thr	Ile	Arg	Gln	Arg	Lys	Glu	Arg	Arg	Gln
			85						90					95	
Gly	Lys	Arg	Glu	Ser	Ala	Lys	Ser	Thr	Ala	Arg	Lys	Leu	Gln	Gln	Gln

100					105					110					
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		115					120					125			
Glu	Val	Gln	Glu	Leu	Leu	Ser	Arg	Phe	Gly	Ile	Pro	Tyr	Ile	Thr	Ala
	130					135					140				
Pro	Met	Glu	Ala	Glu	Gln	Cys	Ala	Glu	Leu	Leu	Gln	Leu	Asn	Leu	Val
145					150					155					160
Asp	Gly	Ile	Ile	Thr	Asp	Asp	Ser	Asp	Val	Phe	Leu	Phe	Gly	Gly	Thr
				165					170					175	
Lys	Ile	Tyr	Lys	Asn	Met	Phe	His	Glu	Lys	Asn	Tyr	Val	Glu	Phe	Tyr
			180					185					190		
Asp	Ala	Glu	Ser	Ser	Ile	Leu	Lys	Leu	Leu	Gly	Leu	Asp	Arg	Lys	Asn
		195					200					205			
Met	Ile	Glu	Leu	Ala	Gln	Leu	Leu	Gly	Ser	Asp	Tyr	Thr	Asn	Gly	Leu
	210					215					220				
Lys	Gly	Met	Gly	Pro	Val	Ser	Ser	Ile	Glu	Val	Ile	Ala	Glu	Phe	Gly
225					230					235					240
Asn	Leu	Lys	Asn	Phe	Lys	Asp	Trp	Tyr	Asn	Asn	Gly	Gln	Phe	Asp	Lys
			245						250					255	
Arg	Lys	Gln	Glu	Thr	Glu	Asn	Lys	Phe	Glu	Lys	Asp	Leu	Arg	Lys	Lys
			260					265					270		
Leu	Val	Asn	Asn	Glu	Ile	Leu	Leu	Asp	Asp	Asp	Phe	Pro	Ser	Val	Met
		275					280					285			
Val	Tyr	Asp	Ala	Tyr	Met	Arg	Pro	Glu	Val	Asp	His	Asp	Thr	Thr	Pro
	290					295					300				
Phe	Val	Trp	Gly	Val	Pro	Asp	Leu	Asp	Met	Leu	Arg	Ser	Phe	Met	Lys
305					310					315					320
Thr	Gln	Leu	Gly	Trp	Pro	His	Glu	Lys	Ser	Asp	Glu	Ile	Leu	Ile	Pro
				325					330					335	
Leu	Ile	Arg	Asp	Val	Asn	Lys	Arg	Lys	Lys	Lys	Gly	Lys	Gln	Lys	Arg
			340					345					350		
Ile	Asn	Glu	Phe	Phe	Pro	Arg	Glu	Tyr	Ile	Ser	Gly	Asp	Lys	Lys	Leu
	355						360					365			
Asn	Thr	Ser	Lys	Arg	Ile	Ser	Thr	Ala	Thr	Gly	Lys	Leu	Lys	Lys	Arg
	370					375					380				
Lys	Met														
385															

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<211> 1161

<212> DNA

<213> Artificial

<220>

<223> cDNA

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agaatttgta agctattata ctttggcatt aggccggtat tcgtctttga tgggtggtgtg	240
cccgtattga aaagggaaac aatacggcag aggaaagaaa gaagacaggg aaaacgagag	300
agtgcgaaat ccaccgctag gaagctgcaa caacagatga aggataaaaag agattcggat	360
gaggtaacta tggatatgat caaagaagtg caagaattac tatcgagggt tggaatcccc	420
tatatcactg cgcctatgga agctgaagca cagtgtgcgg aattgttaca actaaacctt	480
gtcgatggta taattaccga tgacagtgat gttttcttat ttggaggtag aaagatctac	540
aaaaatatgt tccacgaaaa gaactatggt gaattttatg atgcggaatc tattttaaaa	600
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aacctaaaaa attttaaaaga ctggtataat aatgggcagt ttgataaacg taagcaagaa	780
acggaaaata aatttgaaaa agacctgaga aaaaaactgg taaataacga aattatctta	840
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gttaataaac gcaaaaagaa ggggaagcaa aaaaggatta atgaattttt tccaaggag	1080
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<211> 2033

<212> DNA

<213> Artificial

<220>

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Met Glu Ile His
1

ggc ctt gcc aaa cta att gct gat gtg gcc ccc agt gcc atc cgt gag 163
Gly Leu Ala Lys Leu Ile Ala Asp Val Ala Pro Ser Ala Ile Arg Glu
5 10 15 20

aat gac atc aag agc tac ttt ggt cgc aaa gtg gcc atc gat gcc tcc 211
Asn Asp Ile Lys Ser Tyr Phe Gly Arg Lys Val Ala Ile Asp Ala Ser
25 30 35

atg agc atc tac cag ttc ctg att gct gtt cgt cag ggt ggg gat gtg 259
Met Ser Ile Tyr Gln Phe Leu Ile Ala Val Arg Gln Gly Gly Asp Val
40 45 50

ctg cag aac gag gag ggt gag acc acc agc ctg atg ggc atg ttc tac 307
Leu Gln Asn Glu Glu Gly Glu Thr Thr Ser Leu Met Gly Met Phe Tyr
55 60 65

cgt acc atg cgc atg gag aat ggc atc aag cct gtg tac gtc ttt gat 355
Arg Thr Met Arg Met Glu Asn Gly Ile Lys Pro Val Tyr Val Phe Asp
70 75 80

ggc aaa cca cca cag ctg aag tca ggc gag ctg gcc aag cgc agt gag 403
Gly Lys Pro Pro Gln Leu Lys Ser Gly Glu Leu Ala Lys Arg Ser Glu
85 90 95 100

agg cgc gcc gag gct gag aag caa ctg cag cag gct cag cag gct ggg 451
Arg Arg Ala Glu Ala Glu Lys Gln Leu Gln Gln Ala Gln Gln Ala Gly
105 110 115

atg gag gag gag gtg gag aag ttc acc aag agg ctc gtg aag gtc acc 499
Met Glu Glu Glu Val Glu Lys Phe Thr Lys Arg Leu Val Lys Val Thr
120 125 130

aag caa cac aat gat gag tgc aaa cac ctg ctg agc ctc atg ggc atc Lys Gln His Asn Asp Glu Cys Lys His Leu Leu Ser Leu Met Gly Ile 135 140 145	547
cct tac ctt gat gca ccc agc gag gca gag gcc agc tgt gct gcc ctg Pro Tyr Leu Asp Ala Pro Ser Glu Ala Glu Ala Ser Cys Ala Ala Leu 150 155 160	595
gca aag gct ggc aaa gtc tat gct gcg gcc acg gag gac atg gac tgc Ala Lys Ala Gly Lys Val Tyr Ala Ala Ala Thr Glu Asp Met Asp Cys 165 170 175 180	643
ctc act ttt ggc agc ccc gtg cta atg cga cac tta act gcc agt gag Leu Thr Phe Gly Ser Pro Val Leu Met Arg His Leu Thr Ala Ser Glu 185 190 195	691
gcc aag aag ctg ccc atc caa gag ttc cat ctg agc cgc gtc ctg cag Ala Lys Lys Leu Pro Ile Gln Glu Phe His Leu Ser Arg Val Leu Gln 200 205 210	739
gag ctg ggt ctg aac cag gag cag ttt gtg gat ctg tgc atc ctg ctg Glu Leu Gly Leu Asn Gln Glu Gln Phe Val Asp Leu Cys Ile Leu Leu 215 220 225	787
ggt agc gac tac tgc gag agc atc cgt ggc att ggc gcc aag cgg gct Gly Ser Asp Tyr Cys Glu Ser Ile Arg Gly Ile Gly Ala Lys Arg Ala 230 235 240	835
gtg gat ctc atc cag aaa cat aag agc atc gag gag atc gtg agg cgg Val Asp Leu Ile Gln Lys His Lys Ser Ile Glu Glu Ile Val Arg Arg 245 250 255 260	883
ctg gac ccc agc aag tac ccc gtt cca gag aac tgg ctc cac aag gaa Leu Asp Pro Ser Lys Tyr Pro Val Pro Glu Asn Trp Leu His Lys Glu 265 270 275	931
gcc cag cag ctc ttc ctg gag cca gaa gta gtg gac cca gag tct gtg Ala Gln Gln Leu Phe Leu Glu Pro Glu Val Val Asp Pro Glu Ser Val 280 285 290	979
gag ctg aag tgg agc gag cca aat gaa gaa gag ttg gtc aaa ttt atg Glu Leu Lys Trp Ser Glu Pro Asn Glu Glu Glu Leu Val Lys Phe Met 295 300 305	1027
tgt ggt gaa aag cag ttt ttt gaa gag cga att cgc agt ggg gtc aag Cys Gly Glu Lys Gln Phe Phe Glu Glu Arg Ile Arg Ser Gly Val Lys 310 315 320	1075
cgg ctg agt aag agc cgc cag ggc agc acc cag gga cgc ctc gat gat Arg Leu Ser Lys Ser Arg Gln Gly Ser Thr Gln Gly Arg Leu Asp Asp 325 330 335 340	1123
ttc ttc aag gtg aca ggc tca ctc tcc tca gct aag cgc aag gag cca Phe Phe Lys Val Thr Gly Ser Leu Ser Ser Ala Lys Arg Lys Glu Pro 345 350 355	1171

gaa ccc aag ggg cct gct aag aag aaa gca aag act ggg gga gcg ggg 1219
 Glu Pro Lys Gly Pro Ala Lys Lys Lys Ala Lys Thr Gly Gly Ala Gly
 360 365 370

aag ttc cga agg gga aaa taaacctgtc.cttcccctcc actgtccttg 1267
 Lys Phe Arg Arg Gly Lys
 375

accccaggct gtctatctgt tttgtacctt cggetgcagc acatccctct tgtccctcgt 1327

cttgaggaga gttcattgct tccagcgctg cccttcagag ctttccctct cttgaccctg 1387

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cttaaggaag aagaagataa agccgggagc gaggctggag atagtttccc agctggccag 1567

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agagaagtct ggctgacaac agatttagta ctgaccagct gatttttgtg ggcagaaatt 1747

tgaacttgct gcctgctgag tccagtagtt gtgcaggag tgagatggca gtgtttaagt 1807

tttgatttgt agttttttgt ttttgtctct cccctctcca gtgttgggga ttgaccccag 1867

ggcaaaggca ttaagtgtgc cactgacctg tgcttccaag tgatgtttctg acagcctttc 1927

tgaggcaatc aattgaattg aggttttggg agaagaaact gttgttcata ggctattttct 1987

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<211> 378

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 1 5 10 15

Ala Ile Arg Glu Asn Asp Ile Lys Ser Tyr Phe Gly Arg Lys Val Ala
 20 25 30

Ile Asp Ala Ser Met Ser Ile Tyr Gln Phe Leu Ile Ala Val Arg Gln
 35 40 45

Gly Gly Asp Val Leu Gln Asn Glu Glu Gly Glu Thr Thr Ser Leu Met
 50 55 60

Gly Met Phe Tyr Arg Thr Met Arg Met Glu Asn Gly Ile Lys Pro Val
 65 70 75 80

Tyr Val Phe Asp Gly Lys Pro Pro Gln Leu Lys Ser Gly Glu Leu Ala
 85 90 95

Lys Arg Ser Glu Arg Arg Ala Glu Ala Glu Lys Gln Leu Gln Gln Ala
 100 105 110

Gln Gln Ala Gly Met Glu Glu Glu Val Glu Lys Phe Thr Lys Arg Leu
 115 120 125

Val Lys Val Thr Lys Gln His Asn Asp Glu Cys Lys His Leu Leu Ser
 130 135 140

Leu Met Gly Ile Pro Tyr Leu Asp Ala Pro Ser Glu Ala Glu Ala Ser
 145 150 155 160

Cys Ala Ala Leu Ala Lys Ala Gly Lys Val Tyr Ala Ala Ala Thr Glu
 165 170 175

Asp Met Asp Cys Leu Thr Phe Gly Ser Pro Val Leu Met Arg His Leu
 180 185 190

Thr Ala Ser Glu Ala Lys Lys Leu Pro Ile Gln Glu Phe His Leu Ser
 195 200 205

Arg Val Leu Gln Glu Leu Gly Leu Asn Gln Glu Gln Phe Val Asp Leu
 210 215 220

Cys Ile Leu Leu Gly Ser Asp Tyr Cys Glu Ser Ile Arg Gly Ile Gly
 225 230 235 240

Ala Lys Arg Ala Val Asp Leu Ile Gln Lys His Lys Ser Ile Glu Glu
 245 250 255

Ile Val Arg Arg Leu Asp Pro Ser Lys Tyr Pro Val Pro Glu Asn Trp
 260 265 270

Leu His Lys Glu Ala Gln Gln Leu Phe Leu Glu Pro Glu Val Val Asp
275 280 285

Pro Glu Ser Val Glu Leu Lys Trp Ser Glu Pro Asn Glu Glu Glu Leu
290 295 300

Val Lys Phe Met Cys Gly Glu Lys Gln Phe Phe Glu Glu Arg Ile Arg
305 310 315 320

Ser Gly Val Lys Arg Leu Ser Lys Ser Arg Gln Gly Ser Thr Gln Gly
325 330 335

Arg Leu Asp Asp Phe Phe Lys Val Thr Gly Ser Leu Ser Ser Ala Lys
340 345 350

Arg Lys Glu Pro Glu Pro Lys Gly Pro Ala Lys Lys Lys Ala Lys Thr
355 360 365

Gly Gly Ala Gly Lys Phe Arg Arg Gly Lys
370 375

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<211> 30

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

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<210> 12

<211> 13

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 12

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1 5 10

<210> 13

<211> 26

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 13
atgggaattc aaggcctggc caaact

26

<210> 14

<211> 28

<212> DNA

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<220>

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<400> 14
tttattttcc ccttttaaac ttccctgc

28

<210> 15

<211> 22

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 15

Ile Gln Gly Leu Ala Lys Leu Ile Ala Asp Val Ala Pro Ser Ala Ile
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Arg Glu Asn Asp Ile Lys
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<210> 16

<211> 16

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 16

Ser Met Ser Ile Tyr Gln Phe Leu Ile Ala Val Arg Gln Gly Gly Asp
1 5 10 15

<210> 17

<211> 22

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 17

Thr Ser His Leu Met Gly Met Phe Tyr Arg Thr Ile Arg Met Met Glu
1 5 10 15

Asn Gly Ile Lys Pro Val
20

<210> 18

<211> 24

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 18

Gly Lys Pro Pro Gln Leu Lys Ser Gly Glu Leu Ala Lys Arg Ser Glu
1 5 10 15

Arg Arg Ala Glu Ala Glu Lys Gln
20

<210> 19

<211> 20

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 19

Glu Gln Glu Val Glu Lys Phe Thr Lys Arg Leu Val Lys Val Thr Lys
1 5 10 15

Gln His Asn Asp
20

<210> 20

<211> 25

<212> PRT

<213> Artificial

<220>

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<400> 20

Leu Leu Ser Leu Met Gly Ile Pro Tyr Leu Asp Ala Pro Ser Glu Ala
1 5 10 15

Glu Ala Ser Cys Ala Ala Leu Val Lys
20 25

<210> 21

<211> 23

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 21

Leu Thr Phe Gly Ser Pro Val Leu Met Arg His Leu Thr Ala Ser Glu
1 5 10 15

Ala Lys Lys Leu Pro Ile Gln
20

<210> 22

<211> 21

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 22

Ile Leu Gln Glu Leu Gly Leu Asn Gln Glu Gln Phe Val Asp Leu Cys
1 5 10 15

Ile Leu Leu Gly Ser
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<210> 23

<211> 24

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 23

Arg Gly Ile Gly Pro Lys Arg Ala Val Asp Leu Ile Gln Lys His Lys
1 5 10 15

Ser Ile Glu Glu Ile Val Arg Arg
20

<210> 24

<211> 20

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 24

Pro Glu Asn Trp Leu His Lys Glu Ala His Gln Leu Phe Leu Glu Pro
1 5 10 15

Glu Val Leu Asp
20

<210> 25

<211> 22

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 25

Trp Ser Glu Pro Asn Glu Glu Glu Leu Ile Lys Phe Met Cys Gly Glu
1 5 10 15

Lys Gln Phe Ser Glu Glu
20

<210> 26

<211> 22

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 26

Ser Lys Ser Arg Gln Gly Ser Thr Gln Gly Arg Leu Asp Asp Phe Phe
1 5 10 15

Lys Val Thr Gly Ser Leu
20

<210> 27

<211> 16

<212> PRT

<213> Artificial

<220>

<223> Peptide

<400> 27

Lys Glu Pro Glu Pro Lys Gly Ser Thr Lys Lys Lys Ala Lys Thr Gly
1 5 10 15

<210> 28

<211> 1144

<212> DNA

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cagttcctga ttgctgttcg ccagggtggg gatgtgctgc agaatgagga gggtgagacc	180
accagccacc tgatgggcat gttctaccgc accattcgca tgatggagaa cggcatcaag	240
cccgtgtatg tctttgatgg caagccgcca cagctcaagt caggcgagct ggccaaacgc	300
agtgagcggc gggctgaggc agagaagcag ctgcagcagg ctcaggctgc tggggccgag	360
caggaggtgg aaaaattcac taagcggctg gtgaaggtca ctaagcagca caatgatgag	420

tgcaaacatc tgctgagcct catgggcatc ccttatcttg atgcacccag tgaggcagag	480
gccagctgtg ctgccctggt gaaggctggc aaagtctatg ctgaggctac cgaggacatg	540
gactgcctca ccttcggcag ccctgtgcta atgcgacacc tgactgccag tgaagccaaa	600
aagctgccaa tccaggaatt ccacctgagc cggattctgc aggagctggg cctgaaccag	660
gaacagtttg tggatctgtg catcctgcta ggcagtgact actgtgagag tatccggggg	720
attgggcca agcgggctgt ggacctcatc cagaagcaca agagcatcga ggagatcgtg	780
cggcgacttg accccaacaa gtaccctgtg ccagaaaatt ggctccacaa ggaggctcac	840
cagctcttct tggaacctga ggtgctggac ccagagtctg tggagctgaa gtggagcgag	900
ccaaatgaag aagagctgat caagttcatg tgtggtgaaa agcagttctc tgaggagcga	960
atccgcagtg gggtaagag gctgagtaag agccgccaaag gcagcaccca gggccgcctg	1020
gatgatttct tcaaggtgac cggctcactc tcttcagcta agcgcaagga gccagaacct	1080
aagggatcca ctaagaagaa ggcaaagact ggggcagcag ggaagtttaa aaggggaaaa	1140
taaa	1144

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<211> 45

<212> DNA

<213> Artificial

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<400> 29

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<210> 30

<211> 35

<212> DNA

<213> Artificial

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<223> Oligonucleotide

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tgacatcaag agctactttg gccgtaagggt ggcca

35

<210> 31

<211> 37

<212> DNA

<213> Artificial

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<223> Oligonucleotide

<400> 31
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37

<210> 32

<211> 33

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 32
ggatgtgctg cagaatgagg agggtgagac cac

33

<210> 33

<211> 39

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 33
tgggcatggt ctaccgcacc attcgcatga tggagaacg

39

<210> 34

<211> 41

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 34

ctttgatggc aagccgccac agctcaagtc aggcgagctg g

41

<210> 35

<211> 32

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 35

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32

<210> 36

<211> 35

<212> DNA

<213> Artificial

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<223> Oligonucleotide

<400> 36

aattcactaa gcggctggtg aaggtcacta agcag

35

<210> 37

<211> 32

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<213> Artificial

<220>

<223> Oligonucleotide

<400> 37

atgatgagtg caaacatctg ctgagcctca tg

32

<210> 38

<211> 37

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atcccttatc ttgatgcacc cagtgaggca gaggcca

37

<210> 39

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44

<210> 40

<211> 33

<212> DNA

<213> Artificial

<220>

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<400> 40

cttcggcagc cctgtgctaa tgcgacacct gac

33

<210> 41

<211> 36

<212> DNA

<213> Artificial

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<223> Oligonucleotide

<400> 41

caggaattcc acctgagccg gattctgcag gagctg

36

<210> 42

<211> 36

<212> DNA

<213> Artificial

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<223> Oligonucleotide

<400> 42

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36

<210> 43

<211> 41

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 43
aggcagtgac tactgtgaga gtatccgggg tattgggccc a

41

<210> 44

<211> 39

<212> DNA

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<400> 44
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39

<210> 45

<211> 40

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40

<210> 46

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<212> DNA

<213> Artificial

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38

<210> 47

<211> 41

<212> DNA

<213> Artificial

<220>

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<400> 47

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41

<210> 48

<211> 38

<212> DNA

<213> Artificial

<220>

<223> Oligonucleotide

<400> 48

atccgcagtg gggtaagag gctgagtaag agccgccca

38

<210> 49

<211> 32

<212> DNA

<213> Artificial

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<223> Oligonucleotide

<400> 49

gcagcaccga gggccgctg gatgatttct tc

32

<210> 50

<211> 34

<212> DNA

<213> Artificial

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<223> Oligonucleotide

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34

<210> 51

<211> 41

<212> DNA

<213> Artificial

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<210> 54

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34

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<220>

<223> Oligonucleotide

<400> 56
cacgttgact accgtc

16

<210> 57

<211> 25

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<400> 57
gtaggagatg tcccttgatg aattc

25

<210> 58

<211> 16

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<400> 58
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16

<210> 59

<211> 19

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tagcaggctg caggctgac

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<210> 60

<211> 30

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<400> 60

gtcgacctgc agcccaagct tgcgttgctg

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<220>

<223> Oligonucleotide

<400> 63

tgctagagat tttccacat

19

<210> 64

<211> 40

<212> DNA

<213> Artificial

<220>

<223> Polynucleotide

<400> 64

ggccgtatct gggtcgaatt catcaaggga catctcctac

40

<210> 65

<211> 35

<212> DNA

<213> Artificial

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<223> Polynucleotide

<400> 65

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35

<210> 66

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<220>

<223> Polynucleotide

<400> 66

gtaggagatg tcccttgatg aatt

24

<210> 67

<211> 24

<212> DNA

<213> Artificial

<220>

<223> Polynucleotide

<400> 67

gtaggagatg tcccttgatg attc

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gtaggagatg tcccttgatg

20

<210> 69

<211> 26

<212> DNA

<213> Artificial

<220>

<223> Polynucleotide

<400> 69
gtaggagatg tcccttgatg aattcc

26

<210> 70

<211> 35

<212> DNA

<213> Artificial

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<223> Polynucleotide

<400> 70
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35

<210> 71

<211> 24

<212> DNA

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<400> 71
gtaggagatg tcccttgatg aatt

24

<210> 72

<211> 16

<212> DNA

<213> Artificial

<220>

<223> Polynucleotide

<400> 72
cgaaccaga tacggc

16

<210> 73

<211> 40

<212> DNA

<213> Artificial

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<223> Polynucleotide

<400> 73

gtaggagatg tcccttgatg aattcgaacc cagatacggc

40

<210> 74

<211> 19

<212> DNA

<213> Artificial

<220>

<223> Polynucleotide

<400> 74

tgctagagat tttccacat

19